

REMARKS

The following remarks are provided in response to the replacement Office Action (“office action”) mailed January 7, 2008, in which the office action:

- objected to claims 1 and 7 because of informalities.
- rejected claim 7 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
- rejected claims 1 and 7 under 35 U.S.C. §102(b) as being anticipated by US 5,308,999 to Gotou (hereinafter Gotou).
- rejected claims 1-5 under 35 U.S.C. §102(e) as being anticipated by US Pub. 2002/0149031 to Kim (hereinafter Kim).
- rejected claims 7-8 and 10-11 under 35 U.S.C. §102(e) as being anticipated by US Pub. 2002/0177282 to Song (hereinafter Song).
- rejected claims 3 and 9 under 35 U.S.C. §103(a) as being unpatentable over Gotou in view of US 6,475,869 to Yu (hereinafter Yu).
- rejected claims 4 and 10 under 35 U.S.C. §103(a) as being unpatentable over Gotou in view of Kim.
- rejected claims 6 and 12 under 35 U.S.C §103(a) as being unpatentable over Gotou in view of US 5,965,914 to Miyamoto (hereinafter Miyamoto).
- rejected claim 6 under 35 U.S.C §103(a) as being unpatentable over Kim in view of Miyamoto.
- rejected claim 9 under 35 U.S.C §103(a) as being unpatentable over Song in

view of Yu.

- rejected claim 12 under 35 U.S.C §103(a) as being unpatentable over Song in view of Miyamoto.
- rejected claims 2, 5, 8 and 11 under 35 U.S.C §102(b) as anticipated by Gotou, or in the alternative, under 35 U.S.C §103(a) as obvious over Gotou.

The Applicants respectfully request reconsideration of the above referenced patent application for the following reasons:

Objection of claims 1 and 7 because of informalities

Claims 1 and 7 are objected to because of informalities. Specifically, the phrase “portion said bottom surface” in line 5 of claim 1 should read “portion of said bottom surface.” The phrase “opposite a bottom, said” in line 2 of claim 7 should read “opposite a bottom surface, said.” The Applicants herein amend claims 1 and 7 and respectfully request reconsideration of these claims in view of the amendments.

Claim 7 rejection under 35 U.S.C. §112, second paragraph

Claim 7 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Applicants herein amend claim 7 and respectfully request reconsideration of this claims in view of the amendments.

Claims 1 and 7 rejection under 35 U.S.C. §102(b)

Claims 1 and 7 are rejected under 35 U.S.C. §102(b) as being anticipated by Gotou. The Applicants herein amend claims 1 and 7 and respectfully request reconsideration of claims 1 and 7 in view of the amendments and the following arguments.

Amended independent claim 1 includes the element, a “*gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body,*” “*said gate electrode having a top portion and a bottom portion,*” “*wherein said bottom portion of said gate electrode undercuts said top portion of said gate electrode along said pair of laterally opposite sidewalls of said gate electrode.*” In one embodiment of the Applicants’ invention, a two step etch process is used to form a gate electrode. First, an anisotropic etch defines the gate electrode and then an isotropic etch removes gate electrode material from regions underneath a semiconductor body. As a result, a gate electrode is formed having a bottom portion that undercuts a top portion along a pair of laterally opposite sidewalls of the gate electrode, the laterally opposite sidewalls oriented perpendicularly to the laterally opposite sidewalls of a semiconductor body. (See Applicants’ specification, e.g., Figures 6D-6F and related text.)

Gotou fails to disclose a “gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body,” “wherein [the] bottom portion of said gate electrode undercuts [the] top portion of said gate electrode along said pair of laterally opposite sidewalls of

said gate electrode.” The office action points to Figs. 8C and 9C of Gotou to illustrate sidewalls of a gate electrode. (See office action, p. 4, section ‘a’.) However, in Figs. 8C and 9C, the shown sidewalls of a gate electrode (38) are not oriented perpendicularly to the laterally opposite sidewalls of a semiconductor body (33) because Figs. 8C and 9C represent a cross-section taken in the Y-Y’ direction of Fig. 8A. Turning instead to Figures 8B and 9B (cross-section taken in the X-X’ direction), which does illustrate laterally opposite sidewalls of gate electrode 38 oriented perpendicularly to the laterally opposite sidewalls of semiconductor body 33, it is shown that gate electrode 38 of Gotou has the same width at both its top and bottom portions. Thus, **Gotou fails to disclose a “gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body,” “wherein [the] bottom portion of said gate electrode undercuts [the] top portion of said gate electrode along said pair of laterally opposite sidewalls of said gate electrode,”** as taught and claimed by the Applicants.

Amended independent claim 7 includes the elements, a *“gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body,” “said gate electrode having a top portion above said insulating substrate and a bottom portion formed in said insulating substrate,” “wherein said bottom portion of said gate electrode has a larger width than said top portion of said gate electrode along said pair of laterally opposite sidewalls of said gate electrode.”* In one embodiment of the invention, a portion of an insulating substrate is removed using an isotropic etch to undercut and expose a portion of the bottom surface of

a semiconductor body, forming an opening. A gate electrode is then formed in and above the opening. As a result, a gate electrode is formed having a bottom portion with a larger width than its top portion along a pair of laterally opposite sidewalls of the gate electrode, the laterally opposite sidewalls oriented perpendicularly to the laterally opposite sidewalls of a semiconductor body. (See Applicants' specification, e.g., Figures 7D and 8F-8G and related text.)

Gotou fails to disclose a "gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body," "wherein [the] bottom portion of said gate electrode has a larger width than [the] top portion of said gate electrode along said pair of laterally opposite sidewalls of said gate electrode." The office action points to Figs. 8C and 9C of Gotou to illustrate sidewalls of a gate electrode. (See office action, pp. 4-6, section 'b'.) However, in Figs. 8C and 9C, the shown sidewalls of a gate electrode (38) are not oriented perpendicularly to the laterally opposite sidewalls of a semiconductor body (33) because Figs. 8C and 9C represent a cross-section taken in the Y-Y' direction of Fig. 8A. Turning instead to Figures 8B and 9B (cross-section taken in the X-X' direction), which does illustrate laterally opposite sidewalls of gate electrode 38 oriented perpendicularly to the laterally opposite sidewalls of semiconductor body 33, it is shown that gate electrode 38 of Gotou has the same width at both its top and bottom portions. Thus, **Gotou fails to disclose a "gate electrode [having] a pair of laterally opposite sidewalls oriented perpendicularly to [the] laterally opposite sidewalls of [a] semiconductor body," "wherein [the] bottom portion of said gate electrode has a larger width than [the]**

top portion of said gate electrode along said pair of laterally opposite sidewalls of said gate electrode,” as taught and claimed by the Applicants.

Accordingly, the Applicants respectfully request that the Examiner remove the rejection of claims 1 and 7.

Claims 1-5 rejection under 35 U.S.C. §102(e)

Claims 1-5 are rejected under 35 U.S.C. §102(e) as being anticipated by Kim. The Applicants herein amend claim 1, from which claims 2-5 depend, and respectfully request reconsideration of claims 1-5 in view of the amendments and the following arguments.

Amended independent claim 1 includes the element, “a gate dielectric formed on...**only a portion of [the] bottom surface of [a] semiconductor body.**” (See Applicants’ specification, e.g., Figures 6D-6F and related text.)

Kim fails to disclose “a gate dielectric formed on...only a portion of [the] bottom surface of [a] semiconductor body.” Kim does disclose forming a gate dielectric 24 on the bottom surface of a semiconductor body 40. However, gate dielectric 24 is formed on the entire bottom surface of semiconductor body 40. (See Kim, e.g., Fig. 6C.) Thus, **Kim discloses a gate dielectric formed on the entire bottom surface of a semiconductor body, whereas the Applicants teach and claim a gate dielectric formed on only a portion of the bottom surface of a semiconductor body.**

Accordingly, the Applicants respectfully request that the Examiner remove the rejection of claims 1-5.

Claims 7-8 and 10-11 rejection under 35 U.S.C. §102(e)

Claims 7-8 and 10-11 are rejected under 35 U.S.C. §102(e) as being anticipated by Song. The Applicants herein amend claim 7, from which claims 8 and 10-11 depend, and respectfully request reconsideration of claims 7-8 and 10-11 in view of the amendments and the following arguments.

Amended independent claim 7 includes the element, “*a gate dielectric formed on...**only a portion of [the] bottom surface of [a] semiconductor body.***” (See Applicants’ specification, e.g., Figures 7D and 8F-8G and related text.)

Song fails to disclose “a gate dielectric formed on...only a portion of [the] bottom surface of [a] semiconductor body.” Song does disclose forming a gate dielectric 45 on the bottom surface of a semiconductor body 30. However, gate dielectric 45 is formed on the entire bottom surface of semiconductor body 30. (See Song, e.g., Figs. 8A-C and 9A-C and related text regarding the formation of a gate all around (GAA) structure.) Thus, **Song discloses a gate dielectric formed on the entire bottom surface of a semiconductor body, whereas the Applicants teach and claim a gate dielectric formed on only a portion of the bottom surface of a semiconductor body.**

Accordingly, the Applicants respectfully request that the Examiner remove the rejection of claims 7-8 and 10-11.

Claims 3 and 9 rejection under 35 U.S.C. §103(a)

Claims 3 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gotou in view of Yu. Claims 3 and 9 depend from independent claims 1 and 7,

respectively. The Applicants respectfully request reconsideration of claims 3 and 9 in view of the above arguments regarding amended independent claims 1 and 7.

Claims 4 and 10 rejection under 35 U.S.C. §103(a)

Claims 4 and 10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gotou in view of Kim. Claims 4 and 10 depend from independent claims 1 and 7, respectively. The Applicants respectfully request reconsideration of claims 4 and 10 in view of the above arguments regarding amended independent claims 1 and 7.

Claims 6 and 12 rejection under 35 U.S.C. §103(a)

Claims 6 and 12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gotou in view of Miyamoto. Claims 6 and 12 depend from independent claims 1 and 7, respectively. The Applicants respectfully request reconsideration of claims 6 and 12 in view of the above arguments regarding amended independent claims 1 and 7.

Claim 6 rejection under 35 U.S.C. §103(a)

Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Kim in view of Miyamoto. Claim 6 depends from independent claim 1. The Applicants respectfully request reconsideration of claim 6 in view of the above arguments regarding amended independent claim 1.

Claim 9 rejection under 35 U.S.C. §103(a)

Claim 9 is rejected under 35 U.S.C. §103(a) as being unpatentable over Song in view of Yu. Claim 9 depends from independent claim 7. The Applicants respectfully request reconsideration of claim 9 in view of the above arguments regarding amended independent claim 7.

Claim 12 rejection under 35 U.S.C. §103(a)

Claim 12 is rejected under 35 U.S.C. §103(a) as being unpatentable over Song in view of Miyamoto.

Claim 12 depends from independent claim 7. The Applicants respectfully request reconsideration of claim 12 in view of the above arguments regarding amended independent claim 7.

Claims 2, 5, 8 and 11 rejection under 35 U.S.C. §102(b) / 35 U.S.C. §103(a)

Claims 2, 5, 8 and 11 are rejected under 35 U.S.C. §102(b) as anticipated by Gotou, or in the alternative, under 35 U.S.C. §103(a) as obvious over Gotou. Claims 2 and 5 and claims 8 and 11 depend from independent claims 1 and 7, respectively. The Applicants respectfully request reconsideration of claims 2, 5, 8 and 11 in view of the above arguments regarding amended independent claims 1 and 7.

CONCLUSION

The Applicants submit that they have overcome the office action's objections to and rejections of the claims and that they have the right to claim the invention as set forth in the listed claims. The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Pursuant to 37 C.F.R. 1.136(a)(3), the Applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.


Respectfully submitted,

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April 7, 2008

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